

# PATENT ABSTRACTS OF JAPAN

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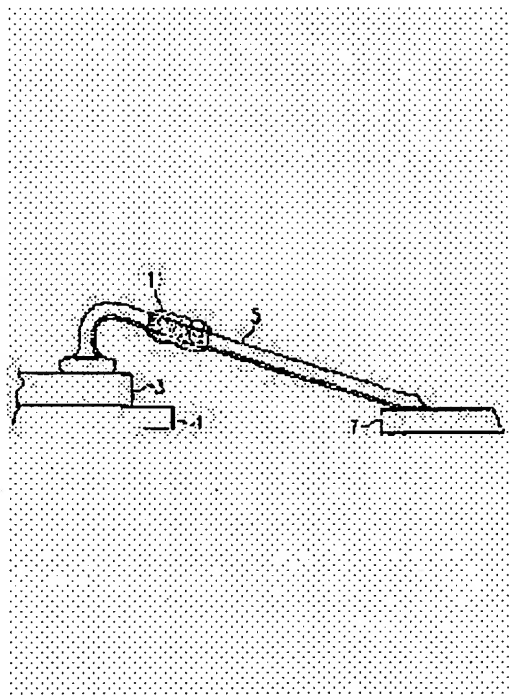
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## (54) SEMICONDUCTOR DEVICE AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a semiconductor device and a method for manufacturing the element by which bonding wires can be maintained in a state where the wires are separated from each other while the wires are bonded to die pads on the chip of the semiconductor device or formed.

SOLUTION: A semiconductor device 1 is provided with a chip carrying a plurality of bonding pads 3 and a plurality of adjacently arranged wires 5. Each wire is extended from one pad 3 with which one end of the wire is coupled. The other end of each wire is coupled with one of lead fingers 7. A mass 11 of a curable fluid adhesive is put on the wires and cured. The viscosity of the adhesive in a fluid state is sufficiently high to make the adhesive to stay on the wires until the adhesive is cured. A preferable adhesive is an epoxy adhesive. It is possible to allow a small amount of the adhesive to be cured under the wires.



## LEGAL STATUS

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**CLAIMS**

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[Claim(s)]

[Claim 1] (a) Chip which has carried two or more bond pads (b) They are two or more wires which adjoined mutually and have been arranged. Each wire Two or more above-mentioned wires which the end was combined with one of two or more of the above-mentioned bond pads, and have been prolonged from there, (c) Semiconductor device including the lump of the adhesives been [ adhesives / it ] united and hardened which covers each of two or more above-mentioned wires, and is stationed, and fixes to each, and separates two or more above-mentioned wires mutually.

[Claim 2] (a) Are the phase of preparing two or more wires which adjoin mutual [ which carried two or more bond pads / the chip and mutual ], and each of two or more above-mentioned wires which carry out adjacency The above-mentioned phase which the end was combined with one of two or more of the above-mentioned bond pads, and has extended from there, (b) The manufacture approach of a semiconductor device including the phase which forms the lump of the adhesives been [ adhesives / it ] united and hardened in order to cover each of one pair of wires with which two or more above-mentioned wires adjoin each other at least, and to fix to each and to separate the above-mentioned wire mutually.

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## DETAILED DESCRIPTION

### [Detailed Description of the Invention]

[0001]

[Field of the Invention] the semiconductor device to which especially this invention is made as for protection of the bond wire in detailed pitch wirebonding about a semiconductor device and its manufacture approach -- and [ especially ] it is related with the approach of wirebonding to the pad of a semiconductor device.

[0002]

[Description of the Prior Art] Generally connection between a semiconductor chip and its external world is made through the bond pad arranged on the front face of a chip. Since the number of the electric components which can be arranged in the volume to which the semi-conductor material was given is increasing continuously, the circuit held in a chip is still more complicated. This needed the increment in the number of the pins in the package held in a chip, and brought about the increment in the number of the bond pads on a chip. In order to adapt oneself to the increment in the number of this pin and bond pads, the pitch of a bond pad must be decreased and a longer bond wire is needed. the die length of a wire increases -- alike -- taking -- these wires -- slackening -- being easy -- thereby -- for example, a failure like a short circuit will be easily caused by hanging down to other conductive elements which must be insulated electrically.

[0003] the wire by which formation of the loop shape by which (1) improvement of the improvement in the adaptability of a long wire was carried out, and (2) improvements were carried out the place by today, and (3) -- it is provided according to a low viscous molding compound and a shaping (mold) process better than (4). By the solution approach in another conventional technique, the loop-formation formation ring placed between the die pads and lead fingers to which the wire is to be connected between them is used. This wire is prolonged [ then, ] on a loop-formation formation ring, is preferably supported in respect of [ highest ] a wire, and makes the minimum the problem which this produces according to the slack of a wire.

[0004] If a dimension furthermore decreases, the wire which must be separated during processing and shaping (mold) will continue approaching mutually. Although the serious problem especially during molding produces this, the reason is because a molding compound moves a wire to the flow direction of a molding compound, and the wire which adjoins each other is moved so that it may collide mutually.

[0005]

[Problem(s) to be Solved by the Invention] It is maintaining in the condition each wire's having been separated during the processing for wirebonding to the pad of a semiconductor device, and shaping.

[0006]

[Means for Solving the Problem] Preferably, it can be made to adhere in the state of a flow, and an above-mentioned technical problem be attained by making it adhere to the highest point of each wire which be the location of the loop formation formation ring of the conventional technique preferably around the wire which already combined desirable adhesives like epoxy, and the adhesives hardened next, and each have separated. Adhesives stand it still on the crowning of each wire with which

separation from an adjoining wire poses a problem, and when connecting with at least one pair of the wire with which adhesives adjoin each other, adhesives interconnect as a single lump to the wire which adjoins it from one wire. Some of adhesives are dropped at right under [ of a wire / the bottom or right under ]. This combines each wire with adhesives and maintains mutual separation of each wire during processing and shaping.

[0007] Preferably, these adhesives can be made to adhere in the state of a flow, are adhesives hardened next, and are epoxy preferably. It seems to have to stand it still on sufficient long period wire front face, in order to harden before the essential part of adhesives trickles the viscosity of adhesives from a wire. The viscosity of adhesives maintains contact in the adhesives on the wire which adjoins each other through hardening again, and seems to have to maintain such contact also after that. If some of adhesives trickle just under a wire and they are held on the chip front face under a wire, in addition to the wire separation by the above adhesives, it turns out [ of the loop-formation formation ring of the conventional technique ] that is operated by raising.

[0008] In an activity, each wire is combined by the standard approach between the die pad on a chip, and a lead finger, and a wire is prolonged in the upper part from a die pad, then, is caudad gone down in the shape of a loop formation, and reaches a die finger. Next, cover a wire, it is made to adhere in the crowning of a loop formation preferably, and the adhesives on one wire with which the adhesives placed on which wire by this also adjoin, or two or more wires are contacted, and adhesives harden the adhesives which can flow. Therefore, if adhesives harden, each wire will be separated mutually and a wire will maintain the relation separated mutually with the property which interconnects from one wire of adhesives to the following wire. A chip can be processed next and a molding compound can be placed after a chip in the condition of maintaining the location where the wire was separated mutually. If some of adhesives trickle on the front face of the chip just under a wire, such adhesives will function the loop-formation formation ring of the conventional technique additionally. It turns out that the function of a loop-formation formation ring is positioned, and can give a loop-formation formation ring which is required in the conventional technique without the step of the addition of making it paste up. Moreover, the precision of positioning of the loop-formation formation ring of the conventional technique does not have the need.

[0009]

[Embodiment of the Invention] First with reference to drawing 1 , only one standard conventional chip 1 with the die pad 3 which are two or more bond pads is shown by here. A wire 5 is prolonged up in the shape of a loop formation from a die pad 3, then is prolonged caudad, and reaches the lead finger 7 which is a part of leadframe (with no illustration). The leadframe had a pin and this pin is prolonged from the final package.

[0010] Drawing 2 shows the structure of drawing 1 where the loop-formation formation ring 9 of the conventional technique has been arranged at the highest neighborhood of a point of a wire 5. The loop-formation formation ring 9 makes min possibility that a wire 5 will contact a chip 1 top circuit other than die pad 3. The loop-formation formation ring 9 prevented moving in a flat surface perpendicular to the space which a wire 5 shows to drawing 2 , and has prevented that the wire which adjoins each other during processing and/or enclosure by this contacts mutually again.

[0011] The wire protection method by this invention is shown in drawing 5 from drawing 3 . The chip 1 with a die pad 3 is best shown in drawing 4 . Although there are two or more die pads 3, generally one die pad is connected with one wire 5. One wire 5 is combined with each die pad 3 as in the conventional technique, and it combines with the lead finger 7, and is shown. It dissociates mutually and each wire 5 is arranged above the front face of a chip 1. As a ring continuous next, the ring 11 of the epoxy in which hardening in which a suitable viscous flow is possible is possible covers, is arranged, and hardens a wire 5 in the original location on a wire. Although the ring 11 of an epoxy adhesive is shown by the desirable example as a continuous ring, if suitable for this reason, he should understand that it may be discontinuous that it has only to extend between the wires 5 which need the assistance for separation including this process, until adhesives result in an enclosure process. Next, a chip is processed and/or packed in the condition of min [ possibility / of the failure resulting from the contact of a wire 5 which is

not right ].

[0012]

[Effect of the Invention] Since the lump of the adhesives which covered, were united and hardened two or more wires prolonged from two or more bond pads on the chip of a semiconductor device, respectively in this invention is stationed, two or more wires are maintained in the location separated mutually, a wire contacts mutually, or also setting to subsequent processing and subsequent shaping, and contacting other circuits on a chip is prevented, and a wire is protected.

[0013] Although this invention explained the specific desirable example, many its modification and alterations are clear to this contractor immediately. Therefore, the claim has the intention of what should be interpreted widely, as long as all modification and alterations can be included in consideration of the conventional technique.

[0014] The following terms are further indicated about the above explanation.

It is a semiconductor device and they are two or more wires which adjoin the chip which has carried two or more bond pads at both (a) (b), and are arranged. (1) Each wire the -- an end -- the above -- plurality -- bond -- a pad -- one -- a \*\* -- joining together -- having -- and -- there -- from -- extending -- \*\*\*\* -- the above -- plurality -- a wire -- (-- c --) -- the above -- plurality -- a wire -- each -- a wire -- covering -- arranging -- having -- and -- each -- a wire -- fixing -- having -- the above -- plurality -- a wire -- mutual -- dissociating -- united -- having hardened -- adhesives -- a lump -- containing .

(2) It is a component given in the 1st term, and each of the above-mentioned wire is combined with one of the above-mentioned lead fingers in the other end, including two or more lead fingers further.

(3) In order to separate mutually the wire with which it is a component given in the 1st term, the wire with which the 2nd plurality adjoins each other is further included, and it is combined with one of the bond pads of the above-mentioned plurality [ wire / each / end / the ], it extends from there, and the 2nd plurality adjoins [ above-mentioned ] each other, these wires are covered, it is arranged and the adhesives which the 2nd which fixed to these was united, and were hardened are included further.

[0015] (4) In order to separate mutually the wire with which it is a component given in the 2nd term, the wire with which the 2nd plurality adjoins each other is further included, and it is combined with one of the bond pads of the above-mentioned plurality [ wire / each / end / the ], it extends from there, and the 2nd plurality adjoins [ above-mentioned ] each other, these wires are covered, it is arranged and the lump of the adhesives which the 2nd which fixed to these was united, and were hardened is included further.

(5) It is a component given in the 1st term, the above-mentioned adhesives can flow and can be hardened, and although it can stand it still on the above-mentioned wire until the above-mentioned adhesives harden the viscosity in the condition which can be flowed, it is enough.

(6) It is a component given in the 2nd term, the above-mentioned adhesives can flow and can be hardened, and although it can stand it still on the above-mentioned wire until the above-mentioned adhesives harden the viscosity in the condition which can be flowed, it is enough.

(7) It is a component given in the 3rd term, the above-mentioned adhesives can flow and can be hardened, and although it can stand it still on the above-mentioned wire until the above-mentioned adhesives harden the viscosity in the condition which can be flowed, it is enough.

(8) It is a component given in the 4th term, the above-mentioned adhesives can flow and can be hardened, and although it can stand it still on the above-mentioned wire until the above-mentioned adhesives harden the viscosity in the condition which can be flowed, it is enough.

[0016] (9) It is a component given in the 1st term, and some above-mentioned adhesives are arranged on the front face of the above-mentioned chip just under the above-mentioned wire.

(10) It is a component given in the 2nd term, and some above-mentioned adhesives are arranged on the front face of the above-mentioned chip just under the above-mentioned wire.

(11) It is a component given in the 5th term, and some above-mentioned adhesives are arranged on the front face of the above-mentioned chip just under the above-mentioned wire.

(12) It is a component given in the 8th term, and some above-mentioned adhesives are arranged on the front face of the above-mentioned chip just under the above-mentioned wire.

(13) It is the manufacture approach of a semiconductor device and is the phase of preparing two or more wires which adjoin mutual [ which carried the bond pad of (a) plurality / the chip and mutual ]. The above-mentioned phase which each of two or more above-mentioned wires which carry out adjacency was combined with one of the bond pads of the above-mentioned plurality [ end / the ], and has extended from there, (b) The phase which forms the lump of the adhesives been [ adhesives / it ] united and hardened so that each of one pair of wires with which two or more above-mentioned wires adjoin each other at least might be covered, and it might fix to each and the above-mentioned wire might be separated mutually is included.

[0017] (14) It is an approach given in the 13th term, and include further the phase of sticking each other end of two or more above-mentioned wires on a lead finger.

It is an approach given in the 13th term, and the phase of preparing the wire which adjoins mutual [ 2nd / two or more ] is included further. (15) Each wire The end is combined with one of two or more of the above-mentioned bond pads, extend from there, and it sets in the above-mentioned phase. In order to separate mutually the wire with which the 2nd plurality adjoins [ above-mentioned ], each of these wires is covered, it is arranged and the lump of the adhesives which the 2nd which fixed to each was united, and were hardened is prepared.

It is an approach given in the 14th term, and the phase of preparing the wire with which the 2nd plurality adjoins each other is included further. (16) Each wire The end is combined with one of two or more of the above-mentioned bond pads, extend from there, and it sets in the above-mentioned phase. In order to separate mutually the wire with which the 2nd plurality adjoins [ above-mentioned ] each other, each of these wires is covered, it is arranged and the lump of the adhesives which the 2nd which fixed to each was united, and were hardened is prepared.

[0018] (17) The chip which is the approach of manufacturing a semiconductor device and has the bond pad of (a) plurality, Two or more wires which the end of each wire is combined with one of two or more of the above-mentioned bond pads, and are prolonged from there, The phase of preparing two or more above-mentioned lead fingers where it is two or more lead fingers, and the other end of each above-mentioned wire is combined with one of two or more of the above-mentioned lead fingers, (b) It is united, and it is the lump of the adhesives which can flow [ that it can harden and ], and the viscosity in the condition which can be flowed includes the phase of coming out of the above-mentioned adhesives to making it standing it still on the above-mentioned wire enough, and preparing the lump of a certain above-mentioned adhesives, and the phase of stiffening the (c) above-mentioned adhesives until it hardens it.

(18) It is an approach given in the 17th term, and the above-mentioned adhesives are epoxy.

(19) It is an approach given in the 17th term, and include further the phase of enabling it to arrange some of above-mentioned adhesives in a phase (b) just under the above-mentioned wire on the front face of the above-mentioned chip, and stiffening the above-mentioned adhesives on the above-mentioned front face of the above-mentioned chip.

[0019] (20) It is an approach given in the 18th term, and include further the phase of enabling it to arrange some of above-mentioned adhesives in a phase (b) just under the above-mentioned wire on the front face of the above-mentioned chip, and stiffening the above-mentioned adhesives on the above-mentioned front face of the above-mentioned chip.

(21) It is the approach and the above-mentioned component which manufacture a semiconductor device, and prepare the chip which carried two or more bond pads. The wire with which the plurality which the end of each wire is combined with one of two or more of the bond pads, and is prolonged from there adjoins each other is prepared. The other end of each wire is combined with one of two or more of the lead fingers. It is the lump of the adhesives which can flow [ that it can harden and ], and the viscosity in the flow condition arranges the above-mentioned adhesives which are epoxy fully for making adhesives stand it still on a wire, and preferably on the above-mentioned wire which carries out adjacency, and then stiffens the above-mentioned adhesives until it hardens it. On the front face of the above-mentioned chip, some of above-mentioned adhesives enable it to arrange just under a wire, and then they may stiffen this.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the side elevation to which the die pad and lead finger of the standard conventional technique are shown, and the wire is connected between them.

[Drawing 2] A standard diode pad and a lead finger are shown, a wire is connected between them, and a wire is a side elevation currently supported in respect of the highest of a wire with the loop-formation formation ring by the conventional technique.

[Drawing 3] It is the plan of the ring of the adhesives by a semiconductor chip and this invention with the wire prolonged from a die pad.

[Drawing 4] It is the sectional view which met the line 4-4 of drawing 3.

[Drawing 5] It is the enlarged drawing of the ring of some wires of drawing 3, and the adhesives on it.

[Description of Notations]

1 Semiconductor Chip

3 Die Pad (Bond Pad)

5 Wire

7 Lead Finger

9 Loop-Formation Formation Ring

11 Ring of Adhesives

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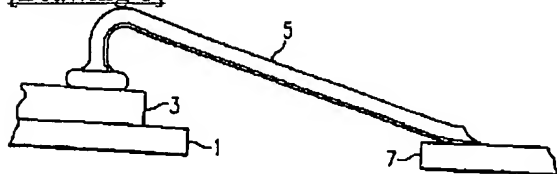
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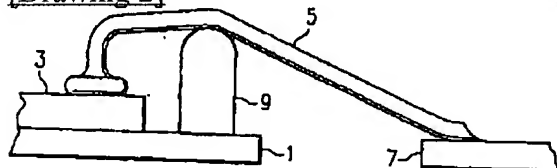
DRAWINGS

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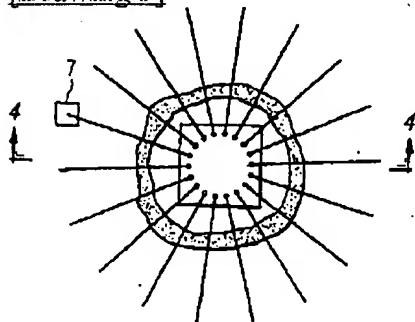
[Drawing 1]



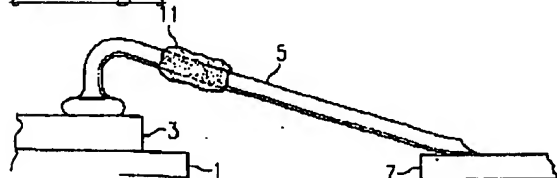
[Drawing 2]



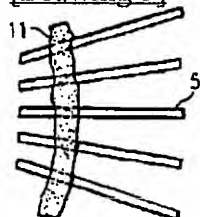
[Drawing 3]



[Drawing 4]



[Drawing 5]



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